

APPARATUS AND METHOD FOR INTERFERENCE MANAGEMENT BETWEEN CELLULAR AND LOCAL AREA NETWORKS

TECHNICAL FIELD

[0001] The present application relates generally to an apparatus and a method for interference management between cellular and local area networks.

BACKGROUND

[0002] This section is intended to provide a background or context to the invention that is recited in the claims. The description herein may include concepts that could be pursued, but are not necessarily ones that have been previously conceived, implemented or described. Therefore, unless otherwise indicated herein, what is described in this section is not prior art to the description and claims in this application.

[0003] In wireless communication, different collections of communication protocols are available to provide different types of services and capabilities. Long term evolution, LTE, is one of such collection of wireless communication protocols that extends and improves the performance of existing universal mobile telecommunications system, UMTS, protocols and is specified by different releases of the standard by the 3rd generation partnership project, 3GPP, in the area of mobile network technology. Other non-limiting example wireless communication protocols include global system for mobile, GSM, high speed packet access, HSPA, and worldwide interoperability for microwave access, WiMAX.

[0004] The improvements of LTE are being made to cope with continuing new requirements and the growing base of users. Goals of this broadly based project include improving communication efficiency, lowering costs, improving services, making use of new spectrum opportunities, and achieving better integration with other open standards and backwards compatibility with some existing infrastructure that is compliant with earlier standards. The project envisions a packet switched communications environment with support for such services as voice over IP, VoIP. The 3GPP LTE project is not itself a standard-generating effort, but will result in new recommendations for standards for the UMTS. Recently, the project moved to planning the next generation standards, sometimes referred to as LTE-Advanced, LTE-A.

[0005] A goal of LTE-A is to provide significantly enhanced services by means of higher data rates and lower latency with reduced cost. LTE-A is directed toward extending and optimizing the current 3GPP LTE radio access technologies to provide higher data rates at very low cost. LTE-A will be a more optimized radio system fulfilling the international telecommunication union radiocommunication sector, ITU-R, requirements for international mobile telecommunications—advanced, IMT-A, while maintaining backward compatibility with the current LTE release.

[0006] LTE-LAN, or LTE-Local Area Network, has been studied for LTE-A. Originally, LTE-LAN aims to provide local area, LA, coverage for indoor residential and enterprise usage with fixed deployment. In such a scenario, a LTE-LAN AP, or access point, provides LTE-based wireless connections to local area devices. The LTE-LAN AP is connected to the core network, CN, via a S1 interface, for example. The mobile terminals establish radio connections with LTE-LAN AP or macro evolved Node B, eNB. This kind of architecture is suitable for fixed deployment in residential and enterprise

environment. In addition to the fixed deployment, other type of LTE-LAN architecture is also considered, for example portable LTE-LAN AP.

SUMMARY

[0007] Various aspects of examples of the invention are set out in the claims.

[0008] According to a first aspect of the present invention, there is provided a method comprising determining a distance from a network element; and assigning at least one of a downlink resource or an uplink resource to the network element based at least in part on the determined distance, wherein the assigned resource is used for both a downlink and an uplink communication of the network element.

[0009] According to a second aspect of the present invention, there is provided an apparatus comprising at least one processor, and at least one memory including computer program code, wherein the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to determine a distance from a network element; and assign at least one of a downlink resource or an uplink resource to the network element based at least in part on the determined distance, wherein the assigned resource is used for both a downlink and an uplink communication of the network element.

[0010] According to a third aspect of the present invention, there is provided a computer program product comprising a computer-readable medium bearing computer program code embodied therein for use with a computer, the computer program code may include code for determining a distance from a network element; and code for assigning at least one of a downlink resource or an uplink resource to the network element based at least in part on the determined distance, wherein the assigned resource is used for both a downlink and an uplink communication of the network element.

[0011] According to a fourth aspect of the present invention, there is provided an apparatus comprising a means for determining a distance from a network element; and a means for assigning at least one of a downlink resource or an uplink resource to the network element based at least in part on the determined distance, wherein the assigned resource is used for both a downlink and an uplink communication of the network element.

[0012] According to a fifth aspect of the present invention, there is provided a method comprising receiving an assignment of resource from a network element, wherein the resource is at least one of a downlink resource or an uplink resource of the network element; and applying the resource for both a downlink and an uplink communication with a device.

[0013] According to a sixth aspect of the present invention, there is provided an apparatus comprising at least one processor, and at least one memory including computer program code, wherein the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to receive an assignment of resource from a network element, wherein the resource is at least one of a downlink resource or an uplink resource of the network element; and apply the resource for both a downlink and an uplink communication with a device.

[0014] According to a seventh aspect of the present invention, there is provided a computer program product comprising a computer-readable medium bearing computer program code embodied therein for use with a computer, the computer